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Special Issue on: ‘New combination between technology, and market or society’

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“Let us conquer the growth limits of capitalism’ is the requirement of academic society in innovation study. This special issue will try to answer to this requirement by focusing on the new combination between technology, and market or society. This special issue of *Science, Technology and Society*(STS) gathered papers for above purpose.

Subject Coverage

Suitable topics include but are not limited to:

- New combination between technology and market
- New combination between technology and society.
- New connection between technology and society

Important Dates and Importance notice

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Manuscripts should be submitted to managing guest editor, jhyun@dgist.ac.kr.

All papers should not exceed 6500 words including references, tables etc.

Editors and Notes

Manuscripts and all editorial correspondence should be addressed to: Dr V.V. Krishna, Editor-in-Chief, Science, Technology and Society, Centre for Studies in Science Policy, School of Social Sciences, Jawaharlal Nehru University, New Delhi 110 067, India (E-mail: stsjournal@gmail.com).

Invited Submissions to the Special Issue

The following selected research papers are invited to the special issue by guest editors. Among this 8 papers will be selected.

Special Issue Paper List (12 papers)

No.	Paper Title
1	Japan's role for innovation system development in Thai automotive industry: an analysis by a dynamic functional approach
2	Grassroots social innovation development: the main trends
3	Identification of Innovativeness Level in New Product and Technology Development Projects: Case of Latvia
4	Internet of Things as a framework for company digitalisation
5	Analysis of the Effect of Technology and Market Dynamism on the SME(Small and Medium sized Enterprises) Business Performances by SME Supporting Services
6	How does a social open innovation succeed? Learning from Buro Battery, and Grassroots innovation Festival of India
7	The Communicative Dynamic Model of Collective Intelligence in Risk Society
8	Participatory Public Service Design by Gov.3.0 Design Group
9	Consumer Acceptance Analysis on Home Energy Management Systems
10	Revisiting LPI index in regionally polarized economies: comparative study for Russia and Kazakhstan
11	CLUSTERS SMART GROWTH AND ENERGY SECURITY: IF CONSISTENT PATTERNS COULD BE TRACED
12	The Impact of Local Government Policy on Innovation Ecosystem: Case Study of Changzhou, China

No.1

Japan's role for innovation system development in Thai automotive industry: an analysis by a dynamic functional approach

Abstract

Purpose/ Research Question: The present study aims at investigating the recent development of innovation system in Thai automotive industry, especially focusing on the roles of Japanese private and public sectors that have made efforts to support local suppliers especially in process innovation. A specific research questions are whether and how the achievements and consequences of Automotive Human Resource Development Program (AHRDP) were supported by Japanese private and public sectors. So as to answer the questions, the study takes a modified dynamic functional change approach, by which we can identify the sustainability of effective interactions of the functions within the system.

Key Literature Reviews (About 3~5 papers): Literature review consists of two parts. Firstly, two studies on sectoral level of innovation in Thailand are reviewed. Regarding Thai automotive and hard disk drive industries, Berger & Diez (2008) concluded local firms were more active in innovative activities but MNC affiliates contributed to the advancement of local firms through interactions such as enhancing upgrading efforts by creating crises, direct/indirect assistance, and improving the science and technology infrastructure and the human capital basis. Intarakumnerd and Chaoroenporn (2013) investigate the roles and capabilities of both public and private intermediaries in Thailand in the case of hard disk drive (high-tech), automotive (mid-tech) and frozen food processing (resource-based) industries. According to their analysis, for automotive industry, government agencies with a clear mandate and budget and insightful local industrial associations may act as 'resource providers' and supported local firms. Regarding the division of labor between public and private intermediaries, the formers should play leading roles in producing 'public goods' such as policy formulation, human resource development and infrastructure provision. The latters should play an active role with industry- or firm-specific issues, such as promoting trust and diffusing technological know-how and information among members, assisting them with upgrading their capabilities and so on.

In our case, AHRDP, Japanese private and public sectors played highly active roles in developing industrial human resources directly and the system for sustainable learning and ultimately process innovation. These contributions were not extensively introduced in Intarakumnerd & Chaoroenporn (2013). Moreover, the degree of private sector involvement was significantly high, compared with the results of Berger & Diez (2008). This is partly because the program was implemented in the context of economic partnership between two countries, providing technical assistances from Japan

and tariff reduction for luxury cars from Thailand. We have a room to be investigated concerning the effects of factors above.

Next, we move on to the literature on analytical framework development. The present study reviews two articles on functions of innovation systems, because their scopes reflected the common understanding of researchers in terms of functions. Hekkert et al. (2007) proposed a framework with a number of processes for well performing innovation systems, called as functions of innovation systems. The framework consists of seven functions, namely, entrepreneurial activities, knowledge development, knowledge diffusion through networks, guidance of the search, market formation, resource mobilization and creation of legitimacy/counteract resistance to change. Those functions are considered to be interacted for effective operation of the system in order to result in technological change. Among the functions, guidance of the search and entrepreneurial activities are expected to be starting points as motors of change. Bergek et al. (2008) operationalized their previous work on a functional approach to analyzing innovation system dynamics into a practical scheme of analysis for policy makers. They showed seven functions mostly similar to those mentioned in Hekkert et al. (2007). In addition to identify the functions, Bergek et al. (2008) provided six steps of analysis; 1. Defining the technology innovation system (TIS), 2. Structural components, 3a. Functions, 3b. Achieved functional pattern, 4. Assessing functionality & setting process goals, 5. Inducement & blocking mechanisms, 6. Key policy issues. This is more comprehensive than the framework of Hekkert et al. (2007) that explicitly described only the third step explicitly. The main application of their framework is the identification of "system failures" or weaknesses, expressed in functional term.

This dynamic functional approach to innovation system was developed for environmental technologies in particular. Hence, we have to modify the framework in order to match with our case, process innovation of local suppliers in Thai automotive industry, which is discussed in the section below.

Design/ Methodology/ Approach: For the purpose of developing a modified framework, we should exclude legitimacy/counteract resistance to change and market formation in both Hekkert et al. (2007) and Bergek et al. (2008) from the system. In Hekkert et al.'s (2007) discussion, entrepreneurial activities directly change the functions excluded while allocation of resources is affected by entrepreneurial activities through legitimacy/counteract resistance to change. Due to removal of two functions, we should link entrepreneurial activities and allowance of resources. In terms of the steps for analysis, we can follow those suggested by Bergek et al. (2008).

(Expected) Findings/Results: The following discussions will be along with the six steps of Bergek et al. (2008)

1. Defining the innovation system in focus

The focus of this study is on AHRDP and succeeding programs by the initiatives by Thai side. AHRDP was implemented to upgrade skill and competency and consequently to improve

productivity of local automotive parts makers, mainly through trainer's training as well as curriculum and institutional development. For this purpose, related actors, trainees, trainers and others in the industry should effectively utilize and diffuse knowledge and skills acquired by trainees. Subsequently knowledge and skills are applied for problem finding and solving in their workplaces, which enhances innovations in the industry. In this regard, the program is understood as the intermediary for developing sectoral innovation system. For AHRDP, four leading Japanese automotive companies have provided their internal training courses for use in this project. These training curriculums include the Mind Management and Manufacturing Skill, the Skill Certification System, the Advance in Mold & Die Development, and Lean Production, mostly relevant to process innovation as their ultimate targets. Japanese experts who are dispatched from these well-known and large Japanese companies teach Thai people their practical skills, knowledge and know-how in the automotive field to develop human resources in Thailand.

2. Structural components

Actors are Japanese experts, their counterparts in Thailand working as master trainers in the succeeding programs, trainees including those who become trainers, others in the industry. Network formations are anticipated especially among master trainers and other trainers. Thailand Automotive Institute (TAI), Thai German Institute (TGI) and National Institute for Skill Development (NISD) are major institutions involved in the program.

3a. Functions & 3b. Achieved functional pattern

During AHRDP, the motor of change was guidance of the search by Japanese experts rather than entrepreneurial activities. In the Hekkert et al.'s (2008) framework, it affects knowledge creation. However, at that stage, knowledge were transferred from Japanese experts and so without the function of knowledge creation, knowledge was diffused to trainees. Thanks to this knowledge diffusion, more participation in the program as entrepreneurial activities are enhanced directly and indirectly through more positive expectations. Allocation of resources increased consequently and then more knowledge diffusion are expected. The program could have a virtuous cycle of functions, as indicated by the achievement of quantitative targets in the number of trainees. Initiatives were taken by Japanese experts but they made efforts to reduce their involvement over time.

After AHRDP, or even later stage of AHRDP, those who learned from the program initiated their entrepreneurial activities enhanced by knowledge development (including both knowledge creation and diffusion). It should emphasized that its process is different from the earlier stage of AHRDP. Through the application of originally learned knowledge and skills, they created new knowledge for improving processes. Some trainers are actively training within their firms. More conspicuously, some participating firms for lean production program organized the group for interactive learning by having seminars and invited non-participating firms to join the group.

4. Assessing functionality & setting process goals

Judging from the results for the third step, active local suppliers are regarded at "the growth phase". However, considering all the local suppliers and other firms intending to be suppliers, coverage of the sectoral innovation system is quite limited. In this sense, we should understand the

industry is still at the formative phase.

5. Inducement & blocking mechanisms

According to the analysis, the strongest inducement is likely to have a results in improving something explicitly. Quality, cost, delivery or any other visible betterment will be the driver for a virtuous cycle. Effective practices are process innovations without doubt. Among sub-programs, lean production is more likely to be linked to improvements. That may be a reason why the voluntary group was established only by the participants of the sub-program. On the other, many firms faced difficulty to send their good employees to trainings, because they are the core figure in the firm and workplaces are afraid to have more trouble if they leave for trainings. Then human resource mobilization is very hard.

6. Key policy issues

Direct subsidies for training is to have positive effects on increase of trainees while this is not sufficient, with considering the discussion so far. Advocacy with successful cases for process innovation may be more promising in order to promote innovation based on learning.

Research limitations/ Implications: Process innovation is still major part of innovation by local suppliers in Thai automotive industry. In this regard, AHRDP is a good case for investigation. The present study dared to analyze its contribution to innovation system development rather than from the perspective of more straightforward HRD. This is because HRD or learning should contribute to better performance especially through innovation. This definition of the innovation system in focus itself is meaningful. By having the broader scope, we can have the prescription for improvement of the program in a more comprehensive way. However, there must be more strict discussion in terms of the link between HRD and innovation. It is necessary to conduct in-depth case studies on applications of knowledge and skills learned from HRD programs.

Car assemblers in Thailand have started R&D activities. Local suppliers with the status of second or third tiers are also necessary to involve more into design of their products. Because of this trend, after the end of AHRDP, Automotive Human Resource Development Institute Program (AHRDIP) was started by Japanese technical assistance in 2011. It expanded the scope into part of research and development activities, along with the demand from local firms and government. However, there was a problem to inhibit interactive learning among the trainees. Because of the nature of R&D, participating firms are more reluctant to share the information on their own projects. Innovation system development may have more difficulty for this level. Further comparative analyses between process and product innovation may create some more useful implications for improving both systems.

Keywords: innovation system, functional analysis, dynamics, automotive industry, Thailand, Japan

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Grassroots social innovation development: the main trends

Abstract

Purpose/ Research Question:

The management and economic literature at the beginning of the 21st century proposed numerous ideas regarding perspectives on capitalism in general and the efficiency of governance frameworks introduced under capitalism in particular. These contributions include critical works addressing issues such as the following:

- the importance of institutions that have been taken for granted under capitalism and their influence on economic development (de Soto, 2000),
- the limitations of "pure capitalism" with respect to value creation (Porter & Cramer, 2011),
- capitalism's inability to overcome poverty (Yunus, 2008),
- capitalism's inability to regulate the distribution of wealth and address the unequal distribution of income across societies (Piketty, 2014),
- new trends in capitalism arising from the network economy (Benkler, 2006).

Thus, social entrepreneurship that is based on social innovation becomes one of the possible key solutions to existing problems.

The role of institutions in social entrepreneurship development had been discussed widely in literature (Dacin et al., 2010; Estrin et al., 2013, Mair&Marti, 2009, Sud et al., 2009) which defines the importance of institutional setting for its development – from outlining that social business models are bound to work in the institutional settings they were created for (Dacin et al., 2010) to questioning the ability of social entrepreneurs to "provide comprehensive answers to most pressing social ills" (Sud et al., 2009). For the purposes of this paper we agree with Sud et al, (2009) and see social business as just one of the ways of both social and economic development (as outlined in the suggested definition), based on the opportunity which was overlooked by "regular" entrepreneurs (Yunus, 2008). We also base our suggestion on findings of Dacin et al. (2010), who states that "social entrepreneurship is more likely to occur where there are significant socioeconomic, cultural and environmental problems". Same is suggested within empirical research: "social entrepreneurship in some developing countries is likely to be shaped by the political context and the heritage of weak governments" (Terjesen et al., 2009), where social market failure creates an opportunity for a social entrepreneur (Austin et al., 2006) and henceforth new social values are created (Urbano et al, 2010) – and still, these thesis, though seem perfectly logical, is not supported

by some empirical testing. For example, Stephan et al. (2014) had found that revenue-generating social business development is strongly associated only with government activism and rule of law – and these two features can rarely be found in economies with weak institutions. GEM report also finds, that equally high level of social entrepreneurship activity can be found in the US, Iceland, Finland (the countries associated with high level of institutional development) and in Argentina, Colombia or Uganda (associated with underdeveloped institutions).

The importance of institutions indicates the following: in case of low institutional development the problem that is not solved by the institutions would be addressed by social entrepreneurs who use grassroots innovation to solve the problems which remain unsolved in traditional ways.

Key Literature Reviews:

1. de Soto, H. 2000. *The Mystery of Capital: Why Capitalism Triumphs In the West and Fails Everywhere Else*, New York, NY: Basic Books.
2. Porter, M., Cramer, M. 2011. *Creating Shared Value*. Harvard Business Review, January, 2011.
3. Yunus, M. 2008. *Creating a World without Poverty: Social Business and the Future of Capitalism*, Public Affairs

Design/ Methodology/ Approach:

The paper uses both qualitative and quantitative analysis – the first one is used to address the appearance of grassroots innovation, while qualitative GEM-based analysis is used to justify the qualitative propositions. The main tool of qualitative analysis is the case method, while the main instrument in quantitative analysis is cluster analysis.

(Expected) Findings/Results:

To solve this contradiction, we suggest the following approach to define how institutions influence organizations with social mission: (1) the type of such organization is influenced by the type of institutions that are prevailing in a field where social entrepreneur see an opportunity – it can be either formal or informal institutions; (2) the type of organization is defined by the inter-country average level of regulatory control and rule reinforcement that can be found in a country (in case of highly polarized countries regional level should be taken into consideration as a moderator).

Thus, social enterprises emerge in case of prevailing informal institutions and relatively low level of regulation and control (which can occur both from laissez-faire or weak state practices). Low level of regulation in this matrix is underlining governmental attitude to market failure: if the regulatory control is high, the government indicates that only the solutions that involve state can be implemented in case of market failure (the examples of such approach are Belarus, Democratic Republic of Korea, Russian Federation that offer strict regulations for any emerging social activities); low regulation level indicates the government agrees to have state-free solutions to social problems (an example of such approach can be Bangladesh, Uganda or Argentina). Quantitative analysis run on the data on Economic Freedom Index (used to measure the level of state regulation, Heritage

foundation) and SEA rate (Terjesen et al., 2009) indicated that there is a positive Spearman correlation between these parameters (.318, significant at 0.05), which supports the idea of mapping social entrepreneurship using the level of regulation scale. The second parameter, prevalence of formal institutions indicates there are paths for solving a social problem, and these are used by either non-profits or socially responsible companies; social enterprises emerge to close the gap that arises from underdeveloped formal institutions, and in many cases (as indicated by Yunus, 2008) supports creation and implementation of new institutions. If regulation is high, but formal institutions are underdeveloped, literature suggests (de Soto, 2000) that informal enterprises will emerge – and this happens in case of enterprises with social mission as well.

Limitations:

The present study has certain limitations, the most important of which is the lack of a quantitative analysis to verify the significance of the proposed models and matrixes, which are derived from a logical analysis of the existing literature and cases on social entrepreneurship based on social grassroots innovation.

Keywords: social innovation, grassroots innovation, social entrepreneurship.

**Identification of Innovativeness Level in New Product and Technology Development Projects:
Case of Latvia**

Abstract

Purpose: Business can function if value is created for the stakeholders. Nowadays the significance of value creation is increasing due to fast technology and competition development. Companies often choose to develop new products, which as a strategy is defined in a fundamental model for diversification, as constructed by Ansoff (1958). Customer behavior, their requirements and values are changing thereby emphasizing the importance of innovation. However, new product development as a growth strategy may provide both advantages and challenges related to the lack of resources and expertise. It may be possible that a new product is launched too early – stakeholders may not be ready to notice the value, and accordingly – the market potential of it. In the past, one of the most outstanding examples of a product potential not being valued was the commercial value of radio (see e.g. Zook and Smith, 2016). Nowadays, for example, the Internet can be considered one of the breakthrough inventions of the last century. At the beginning, society failed to recognize its potential but now it is clear that, individuals, who were able to seize upon the opportunities of the Internet, have created platforms where product value is created by external stakeholders: “Uber, the world’s largest taxi company, owns no vehicles. Facebook, the world’s most popular media owner, creates no content. Alibaba, the most valuable retailer, has no inventory. And Airbnb, the world’s largest accommodation provider, owns no real estate.” (Goodwin, 2015) Moreover, it is known that new products and inventions with a lower value and impact both exist and are being developed. There is a very popular quote – “Innovate or die” (see e.g. Townsend, 2013), and hence *innovation* is one of the most overused terms today – it is often used in advertisements and other marketing communication unjustifiably.

New product development with a high novelty level is significant for a company's competitiveness; meanwhile the state is interested in promoting business activity – eager for new workplaces, tax income and other benefits. The Latvian science, technology development and innovation framework 2014-2020 suggests that sustainable development of the national economy requires encouragement of the economy's structural change in favor of producing products and services with a higher value added, including development of the role of industry, modernization of manufacturing and services as well as development of export complexity; it could be made possible by increasing the innovation based economy competitiveness of Latvia (Ministru kabinets, 2013). Smart specialization strategy provides a requirement for further development of both technological and non-technological innovation as well as entrepreneurial ability and creative development in all economic fields and

the social sector (Ministru kabinets, 2013). To promote innovation, the Latvian science, technology development and innovation framework 2014-2020 established a goal for the proportion of innovative companies to reach 40% among all other companies by year 2020, which is 10 percentage points more than in 2010 and 2014 (Ministru kabinets, 2013) thus emphasizing topicality of new product development.

By implementing support programs, a specific impact on economy is expected from new product and technology development projects. However, in such projects and common practice the measurements of innovativeness are not always well defined, thus the purpose of the Paper is to develop a theoretical framework and identify the innovativeness level in new product and development projects in Latvia.

Key Literature Review: Although it transpires that almost every change is named an innovation in practice thus devaluating the concept's meaning, various novelty classifications have been developed. A deep analysis of innovation classifications is offered by Garcia & Calantone (2002), Hang, Neo, & Chai (2006) and Coccia (2006). A rather less known and not included in abovementioned articles, but possibly the most extensive analysis on novelty level is done by Altshuller (2007), who analyzed several million patents in many rounds. Altshuller (2007) discovered that among analyzed inventions (from their systemic viewpoint) only a few are substantially new. Meanwhile, Technology Readiness Levels (TRL) are more frequently used for technology analysis. TRL is a type of measurement system used to assess the maturity level of a particular technology (Mai, 2015).

Research Approach: The Paper applies Directed Content Analysis (Hsieh and Shannon, 2005) with predefined categories (Ezzy, 2002) as a research method. Categories used for data coding in the research are obtained from literature review thereby testing preexisting theory against empirical data (Mayring, 2000). Considering that the European Union implements support programs for innovation promotion, the authors analyze the following activities implemented in Latvia:

- New product and technology development – support for new product and technology introduction in manufacturing (Part I) (LIAA, n.d.a);
- New product and technology development – support for new product and technology introduction in manufacturing (Part II) (LIAA, n.d.b);
- New product and technology development (LIAA, n.d.c).

According to the purpose of the research, collected data were coded in several sections – to establish the technology readiness level, the innovativeness level and drivers of innovation. Analysis of the data was done independently by both authors to ensure validity of the findings. The codes assigned were discussed and finally the agreed results were presented.

Expected results: Research results show that most of new product and technology development projects analyzed in the Paper do not reach a high novelty or technology readiness level. The results obtained in the Paper are in line with Altshuller's (2007) findings. Based on his approach to novelty level characterization, knowledge from different areas within an industry, other industries or the field of science i.e. technology transfer has to be used in order to achieve a higher level of innovation. Altshuller (2007) has concluded that people use methods for higher-level problem solving that are

relevant only to the lower levels. Therefore, further research is needed to explore how to implement technology transfer for achieving a higher novelty level.

Research limitations and implications: The sample used in the Paper represents a small number of new product and technology development projects, thus generalizability of the results is limited. However, the results confirm a previously identified proportion of innovation levels and emphasize a necessity to implement further research on technology transfer. The theoretical framework developed in the Paper can be applied by companies to new product and technology development as well as policy makers to the planning and implementation of support programs and can serve as a basis for further research.

Keywords: Innovativeness, Innovation Level, New Product Development, Technology, Effectiveness, Measurement, Content Analysis.

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Internet of Things as a framework for company digitalisation

Abstract

Contemporary advantages are coming from the technological evolution from embedded systems to cyber-physical systems. Digitalisation through Internet of Things as a framework creates new the vision of an entirely networked production, its efficiently provide a considerable competitive advantage. These trends are more focused on intangible assets (associated with IC) managing company data flow, plant specific software and the “hardware” of manufacturing technology.

The authors perform empirical research of digitalisation using Internet of Things advantages in e-recruitment methods, transferring knowledge for job seeker through automated processes creating the ability to accomplish these processes in a shorter time. Technology breakthrough is allowing to increase the level of automation for interaction with job-seekers and labour cost decreased.

The electronic environment is used for various needs – for trade, marketing, advertisement, studies, communication, training, etc. Simultaneously, there is an opinion claiming that in future, the majority of businesses will be performed on the electronic market, hence advancing the dominant position of the e-environment in achieving entrepreneurship competitiveness (Nistor et.al., 2010). In recent years, companies’ intellectual capital (IC) has gained increased attention due to globalisation and integration of capital markets, greater mobility of monetary and actual goods, tougher competition, new dominating industries, and developments in information and communication technology (ICT).

Scientists (Beattie & Pratt, 2001; Eustace, 2000; Lev, 2000; Upton, 2001) have argued that demand for in-formation (external communication) on knowledge-based resources is growing as companies increasingly base their competitive strength in the value of know-how, patents, skilled employees and other intangibles. The electronic environment already now offers companies practically all the necessary marketing and communication tools for ensuring company development by creating competitive advantages, nevertheless, not all companies can employ the opportunities rendered by the e-environment, in order to increase company competitiveness and productivity.

The importance of knowledge is found in information processing studies, which have demonstrated that prior knowledge of product characteristics greatly affects the way in which consumers investigate, process, and organize product related information (Alba & Hutchinson, 1987).

The advance of modern ICT has launched the Industry 4.0, to take up a leader role in industrial IT which is currently revolutionizing the manufacturing engineering sector (Germany Trade and Invest, 2014).

Technology breakthrough is allowing to increase the level of automation for cost efficiency (Ashraf & Habaebi, 2015). These trends will is more focused on intangible assets (associated with IC) managing company data flow, plant specific software and the “hardware” of manufacturing technology. Since ICT is only one part of the Industry 4.0, the other is its use in the industrial sector and the utilization of the benefits that it brings to the value chain.

“Industry 4.0” (sometime referred as Smart industry) advantages are coming from the technological evolution from embedded systems to cyber-physical systems. Industry 4.0 connects embedded system production technologies and smart production processes associated with the new technological age advantages. De-centralized intelligence helps create intelligent object networking and independent process management, with the interaction of the real and virtual worlds representing a significant new aspect of the

manufacturing and production process. Industry 4.0 creates the vision of an entirely networked production, in which orders are managed automatically throughout entire value chains, order processing machines and material are organized and their delivery to the customer (Berger, 2014).

Using these data efficiently provides a considerable competitive advantage (reducing downtimes, accurate planning, reducing unit costs and etc.). New Industrial revolution (Industry 4.0) is also called Internet of Things, Data and Services. Cyber-physical systems provide the basis for the creation of an Internet of Things, which combines with the Internet of Services to make Industry 4.0 possible. The widespread adoption by e-recruitment automatic operations of ICT is increasingly blurring the boundaries between the real world and the virtual world in what are known as cyber-physical production systems (CPPSs) (Federal Ministry of Education and Research, 2013).

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Keywords: e-recruitment, Internet of Things, e-business, digitalisation, innovation, information and communication technology.

Analysis of the Effect of Technology and Market Dynamism on the SME(Small and Medium sized Enterprises) Business Performances by SME Supporting Services

Expanded Abstract

Research Objectives and Questions

Research objective of our study is to find the effect of environmental dynamism on the business performances by SME supporting services. Environmental dynamism has been introduced as a moderating variable, utilization degree of SME supporting services was selected as an independent variable and SME business performances such as revenue increase, cost reduction, export increase, employment growth, etc. were selected as dependent variables. Environmental dynamism describes the rate and instability of changes in a company's external environment. To analyze the effect of environmental dynamism on SME supporting services and business performances will be a meaningful study.

Our research questions are as follows.

- Q1. Is there a statistically significant correlation between SME supporting services and business performances?
- Q2. Does the environmental dynamism have a positively or negatively moderating effect on the business performances by SME supporting services?

Key Literature Reviews

H. Jiao et al. conducted an empirical verification of the relationship between innovation strategy and dynamic capabilities, and also analyzed the effect of environmental dynamism on innovation strategy and dynamic capabilities. They postulated that innovation strategy will have a positive relationship with dynamic capabilities and the interaction between innovation strategy and environmental dynamism is positively related to dynamic capabilities. From the statistical analysis, they concluded that innovation strategy has a positive effect on dynamic capabilities, however, the interaction between innovation strategy and environmental dynamism is not significant in predicting dynamic capabilities.

Methodology

11 KISTI SME supporting services were selected to investigate the effects of SME supporting services on SME business performances. Investigation into business performances from SME supporting services was conducted by a survey method. Questionnaires for each SME supporting service were prepared and the survey had been conducted for two months. Moderating effects of environmental dynamism on business performances and SME supporting services was statistically analyzed by using SPSS program.

Expected Results

Correlation and regression results between utilization degree of SME supporting services and SME business performances will be shown. And the moderating effects of environmental dynamism on utilization degree of SME supporting services and SME business performances will be elucidated. The core insights into the role of environmental dynamism in the route from SME supporting services to business performances will be described on our final report.

Research limitations and Implications

The effort to find the route from the provided information to business performances is a meaningful work. However, the scientific logic to measure contribution rate for decision-making and information competitiveness needs to be more refined.

Keywords: SME supporting service, SME performance, environmental dynamism, moderating effect

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How does a social open innovation succeed?

- Learning from Burro Battery, and Grassroots innovation Festival of India

Abstracts

As people pay attentions to social innovation as the source of innovative ideas and the repository of new business models, this study poses the following research questions:

How does a social open innovation succeed?

What is the success factor of social open innovation?

What is the successful dynamics of social open innovation?

This study selected 2 case study; one is the Burro Battery Company in Ghana, and the other is Grassroots Innovation festival of India. The forth is the Social open innovation firm case. But the latter is the Social open innovation policy case. Through deep case study, we found out the ways of success of social open innovation strategy, and social open innovation policy.

Keywords; Burro Battery, Grassroots innovation festival of India, social open innovation, social open innovation strategy, social open innovation policy

1. Introduction

People are beginning to pay attention to social innovation as the source of innovative ideas and the repository of new business models (Bornstein & Davis, 2010, p. 143). In addition, as an important driving force of sustainable capitalism, social innovation is emerging as an important economic form of renewable energy-based economy and the emerging zero marginal cost economy through the spread of the Internet.

1.1. Research Questions

This study poses the following research questions:

How does a social open innovation succeed?

What is the success factor of social open innovation?

What is the successful dynamics of social open innovation?

This study focuses on finding the success factors behind social innovation in the context of open innovation and their changes. We want to know from our research about design for social innovation which is everything that expert design can do to activate, sustain, and orient processes of social change toward sustainability (Manzini & Coad, 2015, p. 62).

1.2. Research Method and Cases

In social constructivism, individuals seek understanding of the world in which they live and work, and develop subjective meanings of their experiences-meanings directed toward creation objects or things (Creswell, 2012, p. 24). As this research explores the success factors behind social innovation that individuals experience in concrete cases of social innovation, it is rooted in social constructivism. In this research, we develop an in-depth description the analysis of 2 cases. For this purpose, we reviewed relevant literatures and conducted interviews.

In the case of the Grassroots Innovation Festival of India, we saw participants in roundtables, awards, and exhibitions from March 4 to 10, 2007. In addition, we conducted in-depth interviews with regard to the innovation motivation and progress of innovators, as well as the cooperation with the governments, markets, research institutes, and colleges during innovation, targeting the 26 cases of the Grassroots Innovation Festival from March 4 to 7 as shown in Appendix 1. New business models were developed from these cases based on the user open

innovation wherein 16 cases made innovations on existing corporate products, the social open innovation wherein 4 socially critical minds developed innovative products, the customer open innovation wherein 4 socially critical minds developed products from the perspective of consumers, and the engineer open innovation wherein 2 cases innovated products from the perspective of engineers (Yun, Yang, & Park, 2016). In addition, we analyzed various literatures on the Grassroots Innovation Festival.

In the case of Burro Battery in Ghana, we conducted in-depth analysis of the literatures, searched information through the Internet, and interviewed the people concerned. African nations, as well as India, have diverse success cases of social innovation. Many cases have been garnering global attention, among them the innovation in Africa's Silicon Savannah and the solar power system of Nigeria (Banks, 2016, pp. 23, 147). Among the cases in Africa, we selected the latest wherein social innovation is strongly growing in the markets.

The Communicative Dynamic Model of Collective Intelligence in Risk Society

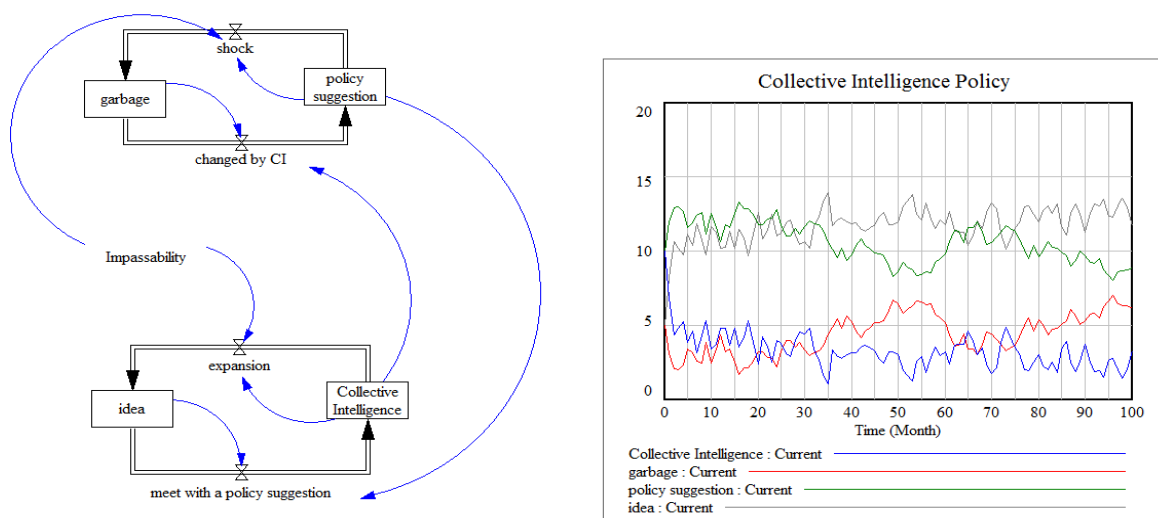
Until few years ago, wisdom was concentrated and represented just by lone geniuses, but now it is represented and performed by communicative or collaborating people which sharing their knowledge arrive to an enriched knowledge that generated collective intelligence.

The creation of a collective intelligence platform can helps to collective absorption of a risk and a greater flexibility to give effectively solutions to the society, the policy and the market.

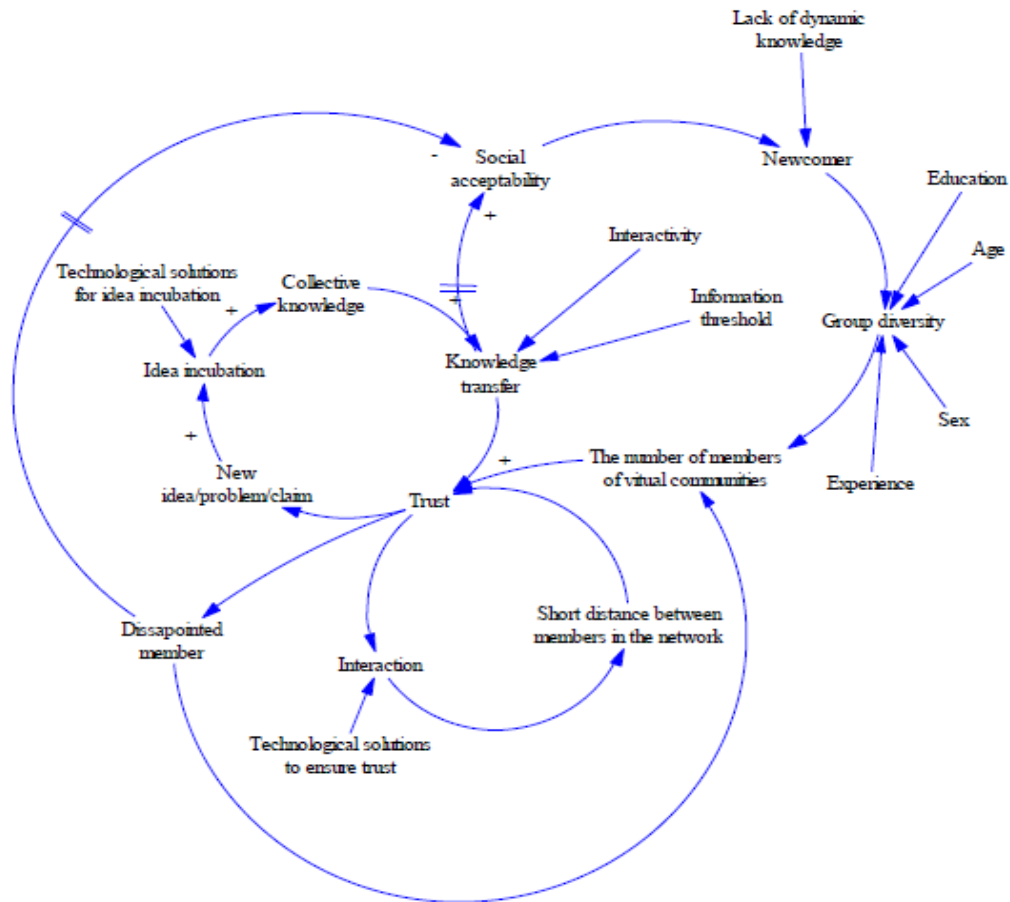
Many researchers have presented significant results in identifying the potential of collective intelligence to solve various societal problems or in modelling CI from a conceptual point of view, but they do not focus on an essential problem – “collective intelligence system design and optimization processes, through which collective intelligence will be able to emerge in a systemic manner.”

Therefore, the main focus of this paper is not on a self-expedient analysis of collective intelligence (CI) as a phenomenon, but on the scientific identification of preconditions and the communicative dynamic model for collective intelligence to emerge, the enunciation of holistic conceptions, the prediction of possible development scenarios of collective intelligence for society.

Key Words: collective intelligence, communicative dynamic model, collective intelligence system design, optimization processes



(Figure 1) Communicative Dynamic Model



(Figure 2) System dynamic model of Collective intelligence

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Participatory Public Service Design by Gov.3.0 Design Group

Abstract

Purpose/ Research Question:As individual citizens' satisfaction with public service has become an important index for evaluating the competency of a nation's policy, there is a need for public service design that is in accordance with the requirements of citizens and able to elevate the citizens' degree of satisfaction. With a focus on the fact that the public service design process lacks publicness, and the resulting delivery gap between the supplier and the user are the main causes of the decrease in the citizens' satisfaction with public service, the present study was conducted to verify the possibilities that open innovation may provide for public service design.

The present study was conducted by using the case of Gov3.0 Design Group, which is a type of citizen-participatory public service design platform. The present study focused particularly on the possibilities that may be found when the iterative thinking-based framework, emphasized by design thinking, and the co-creation-based design methodology are utilized. Accordingly, the following research questions were defined:

1. What is the core value delivered by a citizen-participatory public service design process?
2. What is the synergic effect caused by co-creation in a public service design process?
3. What is the role played by open innovation in securing the publicness of public service?
4. What do the opportunities of design thinking applications suggest in regard to public service design?

Key Literature Review: Efficiency and economic feasibility are the most important factors that have contributed to Korea's distorted economic growth through industrialization in the last five decades. Public service has been led for a long time by a small group of administration experts to accomplish efficiency and economic feasibility in the development and management of public services. Such a top-down public service delivery system has failed to accept the diverse demands that the public

have with regard to public service, thereby extending the service delivery gap between the suppliers and the users. The problems of the public service delivery system are closely related to the process of developing and operating public services. The supplier-focused public service system has been passive in securing communication channels with the users and searching for opportunities to access users' demand. Such a closed feature of the system is a significant factor that makes the users distrust the publicness and transparency of public services. The supplier-focused public service design has failed to satisfy the users due to the top-down delivery system and the closed development process. In other words, while the overall capital input to public services increased day by day, the output did not increase in proportion to the capital in the aspect of citizens' satisfaction, which is considered the result of the government's low policy competency. Hence, there is a need for a novel approach to public service design in order to improve the government's policy competency and to enhance the nation's competitiveness.

The present study was conducted to find a novel approach to public service design. To verify the core value, synergic effect, role, and new opportunities that may be provided by applying design thinking-based open innovation to public service design.

To find the answers to these research questions, a case study was conducted with the Gov3.0 Design Group, which is a type of citizen-participatory public service design platform.

Gov3.0 Design Group was planned and proposed in 2014 by the Ministry of Public Administration and Home Affairs in conjunction with the Ministry of Trade, Industry and Energy, and the Korea Institute of Design Promotion. Gov3.0 Design Group is a policy working group that develops and improves public services by using a service design technique on the basis of the policy suppliers (public servants) and service users (citizens) participating in the entire policy process, including agenda-setting, policy decision-making, enforcement assessment, and feedback. Public service projects are divided into central government projects and local government projects. Public servants, citizens, and relevant experts, such as service designers, work as a group for about two months to discover agendas and produce improvement plans for the currently enforced policies by using service design techniques and processes. The number of projects tested by the Gov3.0 Design Group has increased every year. In addition, the Gov3.0 Design Group won the first prize in the Service Design category of the iF Design Award, indicating that the excellence of the Gov3.0 Design Group was globally recognized as a citizen participatory policy development model.

The Gov3.0 Design Group has three major features. First, with regards to the organization of the working group members, the citizens, otherwise known as the service users, participate in the working group. This enhances the contact with the users and potential demands are discovered so that high quality policies may be realized. Second, with regards to the framework, the Service Design

is utilized. The Service Design is a service problem-solving algorithm based on the iterative thinking emphasized by design thinking. Since the issues of public service have become more complex as the user demand has become diversified, complex problems are solved by an integrated thinking system where divergent thinking and convergent thinking are performed repeatedly. Third, with regards to the methodology, the strategic methodology proposed by design thinking is applied to enhance co-creation by the members. From summarizing these features, the Gov3.0 Design Group may be considered as a valid research subject to verify the innovative possibilities suggested by open innovation based on design thinking in policy-making.

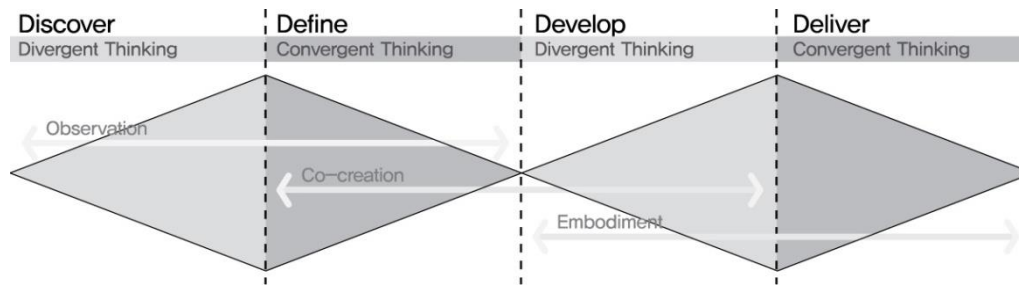
The present study was conducted with the case of Goryeong(name of location) project, which is one of the Gov3.0 Design Group projects conducted in 2016. This case study researches the causes of the delivery gap in the educational support for students studying culinary art at Goryeong High School as the policy targets and proposes a solution to the problem (Table 1).

[Table1] Case-study Outline

Title	Education	Overcoming Mismatch Between Characterization High School Curriculum and Occupations
Policy Target	Adolescents	Goryeong High School students majoring inculinary art
Period of Operation	Eight weeks	08.01.2016 ~09.23.2016
Working Group Organization	Suppliers	Public servants (2 persons)
	Users	Students majoring in culinary art (4 persons)
		Teachers (2 persons) Parents of students (2 persons)
	Experts	Service designer (1 person) Experts in relevant field (4 persons)

The casestudy was conducted on the basis of Double Diamond, which is a type of service design framework. Double Diamond, which is defined by the UK Design Council, is recommended by the Ministry of Public Administration and Home Affairs operating the Gov3.0 Design Group because it has been evaluated as a framework optimized to public service design.

Double Diamond consists of "Discover", "Define", "Develop", and "Deliver" stages, where divergent thinking and convergent thinking are alternately repeated. Therefore, Double Diamond may be considered as an algorithm that reflects design thinking characterized by a repeated thinking process (Figure 1).



[Figure 1] Double diamond, Case-study Framework

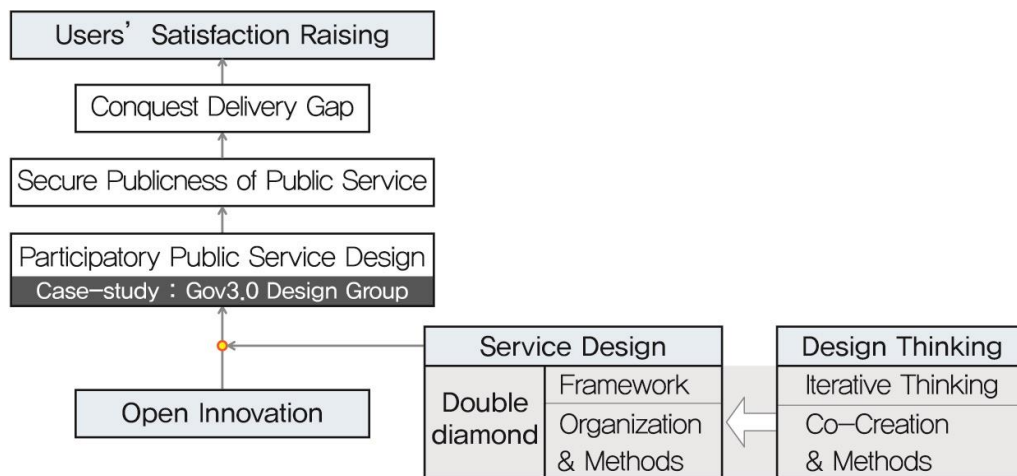
The goals of the individual "Discover", "Define", "Develop", and "Deliver" stages were defined, and the methodology to accomplish the goals was strategically chosen and applied (Table 2).

[Table 2] Case-study Process & Methods

	Goal	Task	Methods
Discover	Discovering potential demand on the basis of empathy, and understanding of interest-based interaction between stakeholders	Understanding of service context through frequent contacts with service users and relevant stakeholders	_Desk Research _Field Research _Contextual Interview _In-depth Interview
Define	Definition of user types and problem category, and establishment of service goals through the summary and analysis of information	Agreement and coordination to establish common service goals	_Relationship map _Persona _Customer Journey map _Stakeholders map
Develop	Development of balanced service solutions considering software, hardware, and networking	Establishment of strategies to develop service solutions in an integrating perspective	_Service Concept _Service Flow _Service Scenario
Deliver	Correction of errors and supplementation of service	Test of service	_Service Blueprint

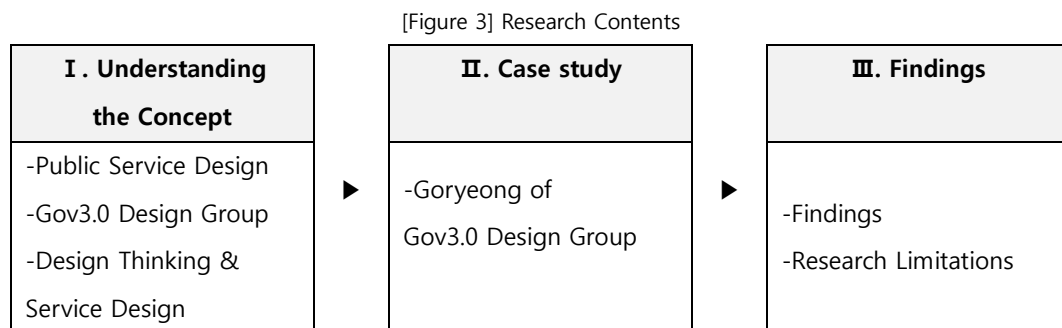
Design: The case study was conducted by using the service design that included the framework established by structuralizing iterative thinking, the main feature of design thinking, and the organizational structure and methodology (Double Diamond) that can maximize the effectiveness of co-creation. The case study was conducted to verify if the participatory public service design may contribute to the securing of publicness and new possibilities that the participatory public service design may suggest were discovered. In addition, the case study was conducted to verify if the satisfaction of public service users may be increased by solving the ultimate problem, which is the

delivery gap (Figure 2).



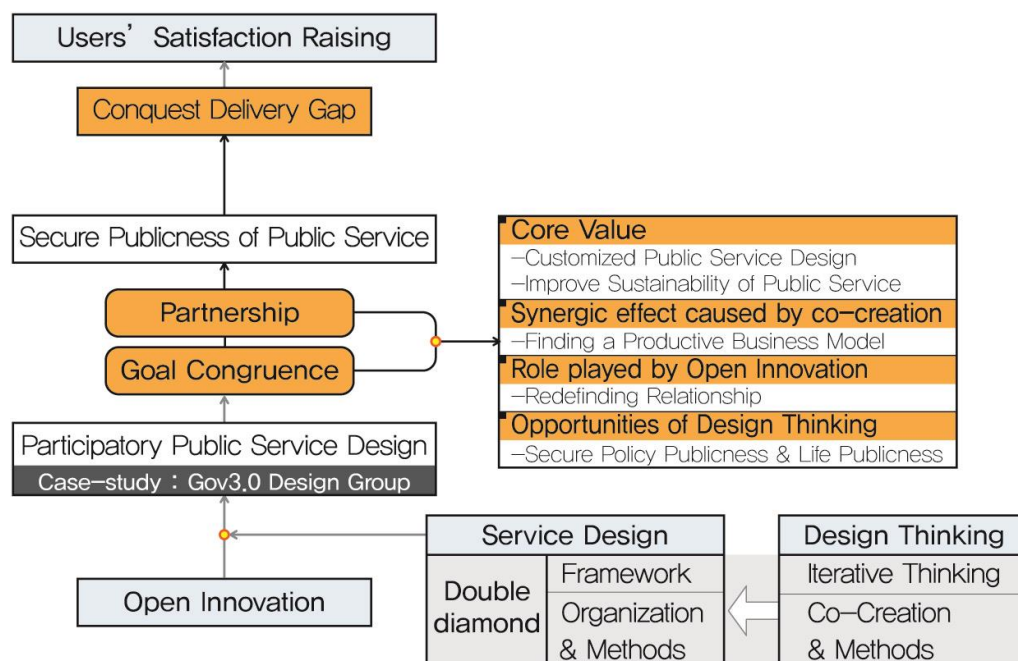
[Figure 2] Research Design

The research contents included three categories. Category I gave the understanding of the definition, delivery system, and purposes of public service, identified the problems of past public service design, and introduced the concept of Gov3.0 Design Group as an alternative solution to the problems.



The characteristics of design thinking and service design were reviewed to understand why Gov3.0 Design Group should apply the service design techniques based on design thinking. On the basis of understanding the concept, Category II introduced the operation procedure of the Goryeong case, which is one of the Gov3.0 Design Group projects, to verify the logical structuring of user demands as well as the problems, opportunities, or possibilities involved in the application of the service design techniques to policy-making as a strategic tool. Category III summarized and analyzed the results of the case study in Category II, listed the findings from the results, and suggested future research topics (Figure 3).

Findings: The findings from the case study were explained by using the study model (Figure 4). When open innovation based on iterative thinking and co-creation, which are the two highlights of design thinking, is applied to the citizen-participatory public service design, the members of the working group accomplish goal congruence, and the service suppliers and users ultimately form not a one-sided support relationship, but a partnership.



[Figure 4] Findings in Research design

From focusing on the changes in the relationship, specific answers to the research questions were found.

First, the core value delivered by a participatory public service design process is the development of user-customized service on the basis of community-based critical mind and the strengthening of service sustainability by promoting the will of voluntarily participating in public services.

Second, the synergic effect caused by co-creation in a public service design process is to develop an integrating service solution on the basis of coordination and agreement of mutual interest. The solution proposes a novel type productive business model that has been neither anticipated nor predicted.

Third, the role played by open innovation in securing the publicness of public service is to re-define the concept of the service supplier-user relationship by collapsing the boundary between service suppliers and service users.

Fourth, the opportunities where the application of design thinking may occur with regard to public service design include not only securing policy publicness through the accomplishment of public

service transparency and publicness, but also the securing of the public life of service users in connection with the stabilization of the life and economic status of service users.

In conclusion, the open innovation based on design thinking may provide a process of re-defining the service supplier-user relationship, which in turn helps to overcome the problem of the delivery gap of the previous public service delivery system and operation process, thereby providing the driving force to increase the satisfaction of service users.

Research limitations: The present study is a practical research based on a case study and focuses on the findings from the process of planning and suggesting public service. Therefore, the present study is limited in quantitatively proving whether or not the users' satisfaction has been increased by the realization of the proposed policy.

Keywords: Public Service Design, Iterative Thinking, Co-Creation, Goal Congruence

Consumer Acceptance Analysis on Home Energy Management Systems

Abstract

The purpose of this paper is to study the consumer acceptance on the HEMS (Home energy management systems) which is the next generation electronic management system that Korean government plans to implement in households. The HEMS is a critical device in maximizing the efficiency of electric energy consumption for each household by using smart grid. Because it can visualize the real time price information on the electricity, households can easily monitor and control the amount of electricity consumption. With this feature, the HEMS can contribute to consumers' total energy savings. This is a major reason why the Korean government implements it nationwide. Since HEMS is a product that has applied new technology that has not yet been directly encountered by consumers, there may be a difference in the level of public perception of HEMS. Therefore, the impact of consumers' awareness of HEMS on their intention to use is important. To do this, the TAM (Technology Acceptance Model) is utilized in this study. Traditional research of TAM is including of awareness of usefulness and ease to use as well as intention to use. In contrast, in this research, an extended TAM with four additional factors such as economic benefit, social contribution, environmental responsibility and innovativeness that may affect the consumer's awareness of usefulness and ease of use is proposed. The survey is conducted with 287 respondents to collect the data. As a result, the proposed model is proven to be suitable in explaining the intention to use with a 70.3% explanation power. It is found that economic benefit (0.231) and innovativeness (0.259) impact on usefulness of HEMS. Moreover, usefulness (0.551) has a bigger effect on intention to use than ease of use (.338) does. Based on this, it is desirable for the Korean government to pursue a public relations strategy that emphasizes the economic benefits, social contributions, and environmental responsibility that will be gained when introducing HEMS. In the beginning, it can be seen that it is effective to focus on PR for consumers who are inclined to accept innovation. In addition, it is considered that when referring to the usefulness of the HEMS, rather than referring to ease of use, more effective results can be obtained.

I. Purpose

A smart grid, also known as smart electrical grid, is an enhancement of the existing power grid and it utilizes the flows of electricity and information to build an advanced self-monitoring and distributed energy transfer network. By utilizing state-of-the-art information technology, the smart grid can supply power more efficiently and it is possible to cope with various events such as failures which occur anywhere in the grid. (Fang et al., 2012). Home Energy Management System (HEMS) utilizes a smart grid to monitor and measure electricity usage in real time. It ultimately contributes to consumer's total energy savings (Niyato et al., 2011). Therefore, the Korean government decided to install HEMS nationwide by establishing a system capable of operating the national intelligent power grid (Kim et al., 2011). Since HEMS is a product that has applied new technology that has not yet been directly encountered by consumers, there may be a difference in the level of public perception of HEMS. Therefore, it is necessary to grasp the acceptance intention of the product that the consumer perceives, but the study analyzing the acceptance intention of the HEMS has not yet proceeded in various ways and it is difficult to establish an effective PR strategy. Based on these problems, this study aims to investigate the factors influencing consumers' acceptance intention of HEMS. Through this study, we try to help the government to figure out the acceptance factors of the consumers and to get the government to effectively implement the successful distribution of HEMS.

II. Key Literature Reviews

So far, much research has been done to find out what factors influence the acceptance of new products or the direction of new technology development. These studies have been applied to identify the determinants of consumer behavior in social psychology or to evaluate consumers' acceptance of new information and technologies. These research methods include TRA (Theory of Reasoned Action), TPB (Theory of Planned Behavior), and TAM (Technology Acceptance Model). TAM, introduced by Davis (1989), is a model applied to examine consumer acceptance of information technology, and is a model for assessing the effects of perceived utility and ease of use on consumer acceptance intention (Baek, 2009). Therefore, TAM is widely used not only for information technology acceptance but also for empirical studies to grasp consumers' willingness to accept new products.

The extended Technology Acceptance Model (ETAM), which includes external factors influencing the process of accepting information technology, has been proposed by Venkatesh and Davis (2000), and afterwards there have been many studies that specify external factors that may influence the technology acceptance process. Shih (2004) presented an ETAM by including users' search ability that can reflect characteristics of internet as an extended variable. In the study, Shih (2004) found that large-scale enterprise Internet users showed higher acceptance intention than individual and small-scale Internet users. In addition, Celik and Yilmaz (2011) added external variables such as information quantity, service quality, system quality, reliability, and shopping pleasure to TAM for research on accepting a new technology called Internet shopping. The results show that all external variables used in the ETAM have an influence on the intention to use. Therefore, it can be concluded that the ETAM including such external variables is effective in developing a concrete policy model

Four factors, economic benefits, social contribution, environmental responsibility, and innovativeness, which are external factors used in this study, were used as major factors in measuring consumer acceptance intention in previous studies. In a study that analyzed consumer acceptance intentions based on economic benefits, Mert et al (2008) found that the reduction in electricity bills, an economic benefit gained through products with smart technologies, could be an important motive for using smart electric appliances. In addition, a study by Powers (1992) analyzed the incentive to use electricity to reduce energy usage to consumers. Regarding social contribution, Selman (1996) analyzed that it is effective to change the lifestyle and attitude of individuals through socialization to have a sense of belonging as members of society. Kranz (2011) examined whether it influences consumers' acceptance of eco-friendly information technology. As a result of the analysis, it was found that the intention of adopting eco-friendly information technology changes according to the degree of influence of interest from environmental protection and society. Arkesteijn and Oerlemans (2005) argue that even if people perceive environmental responsibility as important, it has been shown that environmental responsibility does not affect the intention to accept eco-friendly information technology unless people have a specific knowledge of the effects of eco-friendly information technology and climate change. Lewis et al (2003) examined the propensity for innovation acceptance, a variable introduced from the perspective of individual characteristics apart from personal perception and social motivation. In his study, he examined whether the willingness to accept information technology is influenced by the organization and social phenomena to which the individual belongs. As a result, he proved that the organizational and social contexts do not have a major impact, but that the individual 's willingness to accept is influenced by the tendency to accept innovation. In addition, Leung and Wie (1998) demonstrated that the high innovation acceptance propensity of potential consumers positively influenced the acceptance of new technologies.

III. Methodology

The research model proposed in this study is shown in <Figure 1>.

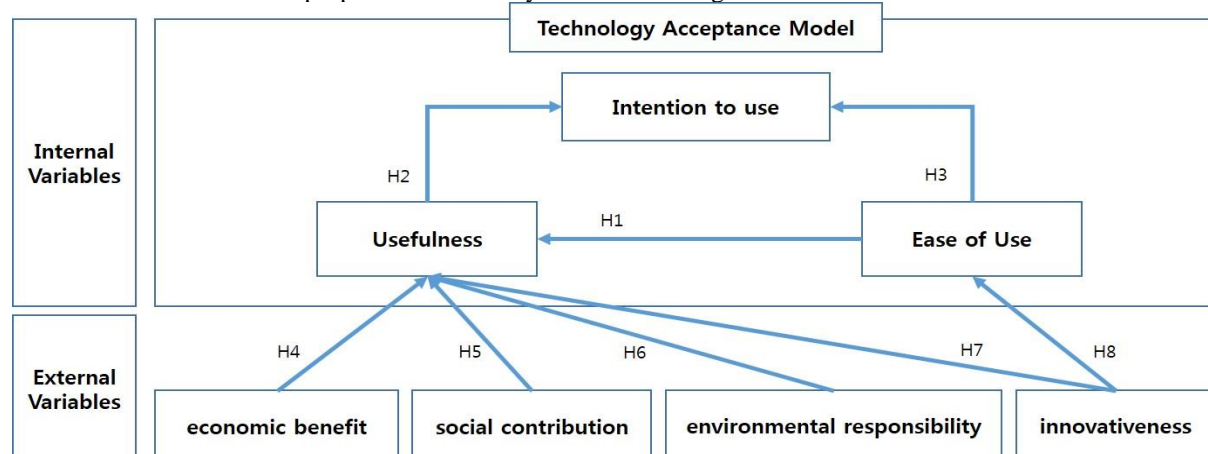


Figure 1. Proposed Conceptual Model

In this study, the extended TAM is constructed by adding four factors that might affect consumer's intention to use for HEMS.

- Hypothesis 1:** Ease of use will positively influence usefulness.
Hypothesis 2: Usefulness will positively influence intention to use.
Hypothesis 3: Ease of use will positively influence intention to use.
Hypothesis 4: Economic benefit will positively influence usefulness.
Hypothesis 5: Social contribution will positively influence usefulness.
Hypothesis 6: Environmental responsibility will positively influence usefulness.
Hypothesis 7: Innovativeness will positively influence usefulness.
Hypothesis 8: Innovativeness will positively influence ease of use.

IV. Results

In order to verify the hypothesis of the research model, the path coefficients were obtained and the results as shown in the following table were derived. The results show that external factors such as economic benefits, social contribution, environmental responsibility, and innovativeness tend to have a positive impact on usefulness and that innovativeness has a positive effect on ease of use. In addition, ease of use has a positive effect on usefulness, and both usefulness and ease of use have positive effects on intention to use. In other words, as shown in the table, the p-value for the path for all hypotheses is adopted at a level smaller than 0.01, which shows that there is a positive effect.

Results of Hypothesis Testing

Hypothesis	Path Coefficient (Standardized)	<i>t</i> -Value	Supported or not
H1: EU → US	0.195	4.354*	Supported
H2: US → IU	0.551	10.960*	Supported
H3: EU → IU	0.338	6.329*	Supported
H4: EB → US	0.231	4.607*	Supported
H5: SC → US	0.170	3.001*	Supported
H6: ER → US	0.165	3.921*	Supported
H7: IN → US	0.259	4.754*	Supported
H8: IN → EU	0.697	19.049*	Supported

Note: Bootstrap sample = 5,000. * All *t*-values are significant at the 0.000 level

The effect of path coefficients on the variables shows that the effect of usefulness on intention to use is greater than the effect of ease of use on intention to use. It can be concluded that the consumer's perceptions of HEMS are more important for the usefulness of the product when comparing the ease of use with the usefulness that affects the intention to use. In addition, the degree of influence on usefulness is the order of innovativeness (H7; 0.259), economic benefit (H4; 0.231), social contribution (H5; 0.170), environmental responsibility (H6; 0.165).

V. Research implications and limitation

The purpose of this study is to analyze the HEMS consumer acceptance intention by using extended TAM. This implies that necessary factors for the consumer's intention to use, which is the subject of HEMS, are demonstrated. All four factors, such as economic benefit, social contribution, environmental responsibility, and innovativeness, tend to affect usefulness and ease of use. Ease of use influenced usefulness and intention to use, and usefulness influenced intention to use. It can be concluded that social motivation, personal motivation, and personal characteristics influence the acceptance of new technology. Based on this, it is desirable for the Korean government to pursue a public relations strategy that emphasizes the economic benefits, social contributions, and environmental responsibility that will be gained when introducing HEMS. In the beginning, it can be seen that it is effective to focus on PR for consumers who are inclined to accept innovation. In addition, it is considered that when referring to the usefulness of the HEMS, rather than referring to ease of use, more effective results can be obtained.

In this study, only the respondents living in the metropolitan area including Seoul are surveyed and the difference is not compared in various regions. Future studies should be conducted to identify differences in acceptance factors by region. Since the function of the actual HEMS increases the power saving effect when a lot of consumers install it in each household in nationwide unit, analysis of nationwide unit will lead to more meaningful implications.

Keywords: Home Energy Management Systems, Smart Grid, TAM, PLS-structural equation modeling

Revisiting LPI index in regionally polarized economies: comparative study for Russia and Kazakhstan

Abstract

Purpose/ Research Question: During past 5 years Russian Federation and Kazakhstan had invested in transport infrastructure development over 380 billion euro of state money, and the about the same amount of investments was made by private and state-owned companies; special investments made to ensure infrastructure quality for major international events such as Sochi 2014 Olympics or Expo-2017 have added investments in logistics infrastructure. According to transportation system development strategies in these countries in upcoming years total investments in transportation system development would be almost doubled. As a result of this strategy implementation shipment through Russian ports should increase 2.2 times, railroad transportation due to development of New Silk Road, cargo transportation speed in both countries should increase more, than 4 times leading to 97% on-time-delivery rate (opposite to 67%). At the same time the restructured transportation system is bound to become eco-friendly (according to the strategy, pollution from transport should be decreased by 70% by 2030), which can be achieved by implementation of new technologies in transportation system development. Taking into consideration the territory of Russian Federation and Kazakhstan and very high level of depreciation of existing capital funds, ramified structure of transportation system, climate limitations and ecological and environmental restrictions, implementation of the suggested strategy becomes a complex task that requires specific competences on national, regional and local level - which include the need for optimization of transportation flows by use of adequate software solutions. Implementation of such solutions should lead to 2-3 multiplicative effect on development of socio-economic systems.

At the same time according to analysis of transportation development strategy and relevant federal and regional implementation in both countries, instead of achieving multiplying effect by introduction renewed infrastructure, the measures taken to improve transportation infrastructure currently result billion euro losses for the companies running newly developed infrastructure. According to expert estimations, one of the reasons for this is the lack of specialist in logistics management, who could provide optimization of transportation flows.

According to Boston consulting group and Russian Chamber of Trade and Commerce's analysis of Russian and Kazakhstan logistics perspectives, the main obstacles for efficient logistics in Russia are: (1) low average speed of transportation (11-14 km per hour on railroad) - this challenge can be addressed by optimization of transportation flows and use of alternative transportation options; (2) low level of direct investments in infrastructure - can be addressed by increase in efficiency of state

investments; (3) absent or unbalanced logistics infrastructure - which can be addressed by optimization of storage premises which are currently concentrated in certain areas of the country; (4) customs and other legal procedures that require significant time to fulfill - can be addressed by educating specialists in the field; (5) lack of competence and small scale of logistics companies - can be addressed by educating specialists.

The other important question is that overall estimation of logistics perspectives for both Russia (1st largest country on Earth) and Kazakhstan (9th largest country) can not be assessed along the same guidelines for the whole country – some of the regions are much less inhabited (for example, in Russia 86% of the population lives in European part while the rest live in bigger Asian part), others witness higher development of ground transportation, third ones experience high level of traffic intensity while the others use a variety of transportation methods efficiently. Thus we propose the need to develop an instrument to assess large countries by means of sophisticated LPI that considers internal differences within the country. The need for such instrument was discussed by several authors (for instance, Behar, 2010), and in this paper we target empirical evaluation of LPI index in polarized economies of Russian Federation and Kazakhstan.

Key Literature Reviews:

1. LPI index reports. Retrieved from <http://lpi.worldbank.org/report>
2. Behar A. Do managers and experts agree? A comparison of alternative sources of trade facilitation data. UK, University of Oxford, 2010.
3. Ojala, L., Celebi, D. The World Bank's Logistics Performance Index (LPI) and Drivers of Logistics Performance. Retrieved from <http://www.itf-oecd.org/sites/default/files/docs/ojala.pdf>

Design/ Methodology/ Approach:

Russian Federation and Kazakhstan regions experience high spatial inequalities in terms of income, logistics development, transportation routes development, shipment opportunities and many others. This does not represent a new problem – in literature spatial polarization have been addressed several times (Kanbur and Venables, 2005), and researchers have found a number of reasons behind the problem. For example, economic growth is in many cases considered the consequent of uneven regional and urban development, and policy makers in many cases develop specific policies to provide better regional development by means of special programs. In Russia and Kazakhstan development of logistical infrastructure is being implemented to ensure lessening of spatial polarization in both countries. This leads to a variety of outcomes, but the fact indicates that in existing circumstances one should address LPI index developed for the whole country like Russia or Kazakhstan keeping in minds the spatial differences which are very important for both states.

In the paper we use case study method to approach differences between 6 regions in Russian Federation and 3 regions in Kazakhstan to compare these results with the evaluation provided by LPI index as an average characteristic of the country.

(Expected) Findings/Results:

Figure 1 presents the difference between evaluation of Russian and Kazakhstan LPI index; as our preliminary research indicates, almost the same variety of results can be found when different regions of both countries are assessed along the same methodology. An indirect confirmation of this thesis comes from high increase Russia had witnessed in Doing business ranking when the country was evaluated not on the basis of one capital city, Moscow, but Saint-Petersburg was also taken into consideration. In this paper we expect to see the same disproportion in LPI index assessed in different regions of the states in question.

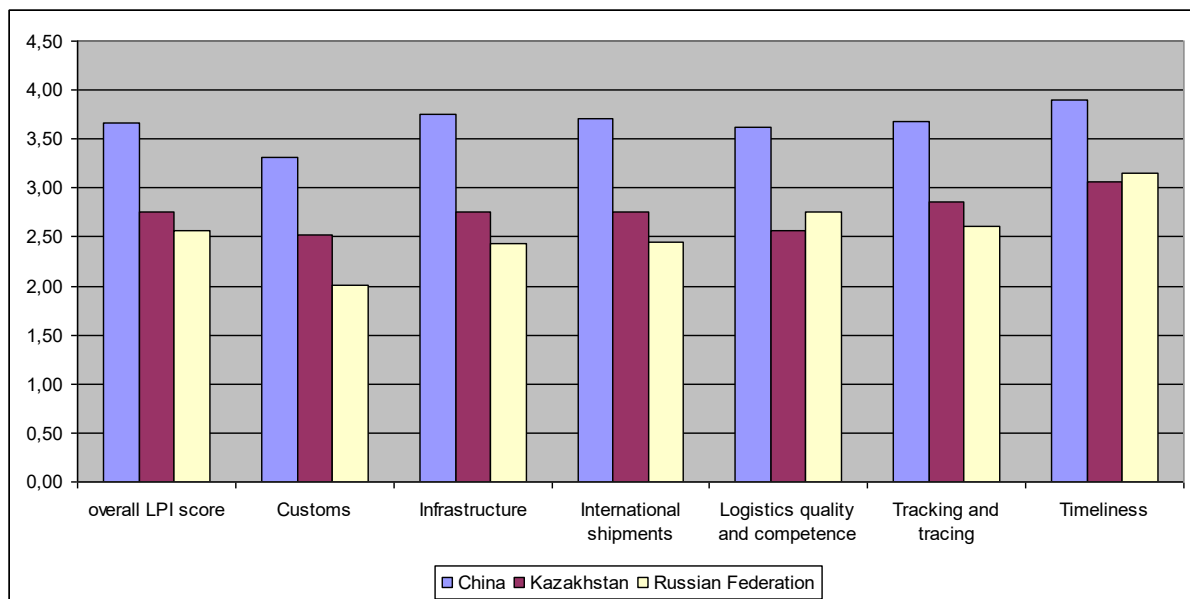


Figure 1. Comparative analysis of Russian and Kazakh LPI in comparison to regional leader China

Keywords: LPI index, logistics, spatial differentiation.

CLUSTERS SMART GROWTH AND ENERGY SECURITY: IF CONSISTENT PATTERNS COULD BE TRACED

In the presented considerations specific aspects of clusters' role in sustainable development through energy security enhancement are being discussed.

Research topicality

- An assumption of role of clusters as driving force of smart growth with respective effect on service sector development is being raised and discussed. It is claimed, that smart growth will contribute to expansion of service sector; i.e. will accelerate the processes observed now.
- Analytical part of the paper is devoted to long range forecasting (until year 2050) of energy intensity of service sector in selected countries of different development. The aim of such forecasting is to reveal if energy intensities in service sector will diminish and converge, as a result of innovative processes affected by clustering of stakeholders.
- Role of interaction of business companies and universities is amply discussed, role of state is hardly to neglect. We believe, that society at the current moment remains underappreciated in terms of its impact on clusters' efficiency, and consequently, on regional and other types of development. Society from economic point of view embraces householders, business companies, and governments, and even universities, since everywhere human habits, beliefs and approaches towards energy consumption (as in our case) are ultimately determined by human beings which are constituents of society. Interaction among listed members of clusters, which are stakeholders at the same time, inter-tangling of different cultures and transfer of technology leads to new spurs of growth based on shared technologies, values and behaviors.
- We claim that clustering of listed stakeholders through technology and consumption culture transfer affect energy intensity change trends in service sector and pushes it down. Therefore diminishing energy intensity as a result of smart growth facilitated by phenomenon of clustering of heterogeneous stakeholders is being expected. We argue, that interrelationships among clusters, smart growth and energy security (through diminishing energy intensity in service sectors of differently developed countries) could be traced.
- We assume that indicated interrelationship does not depend of level of countries' development, but rather is universal and determined by currently achieved level of information technology. This assumption is being verified through comparisons of forecasted energy intensities in selected countries until year 2050. Forecasting is being performed basing on *ceteris paribus* assumption. We admit that indicated assumption can be considered as research limitation, anyway results of forecasting allows us observe trends conditioned by current state of economic development, demographic trends, used energy mix, state of technology and consumption patterns.

Clusters and energy security in the latest literature

Results Analysis

[<<Back to previous page](#)

71 records. TITLE: (Clusters energy efficiency)

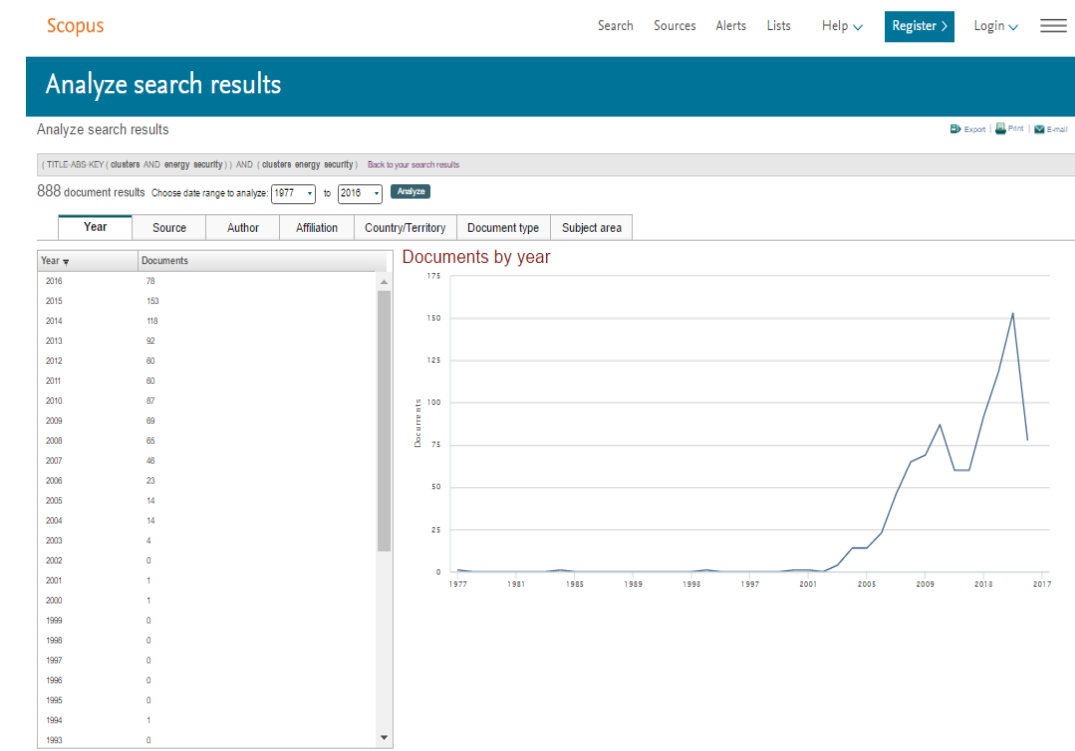
Rank the records by this field:	Set display options:	Sort by:
<div> <div>Authors</div> <div>Book Series Titles</div> <div>Conference Titles</div> <div>Countries/Territories</div> </div>	Show the top <input type="text" value="10"/> Results. Minimum record count (threshold): <input type="text" value="2"/>	<input checked="" type="radio"/> Record count <input type="radio"/> Selected field
<input type="button" value="Analyze"/>		

Use the checkboxes below to view the records. You can choose to view those selected records, or you can exclude them (and view the others).

<input checked="" type="button" value="View Records"/> <input checked="" type="button" value="Exclude Records"/>		Field: Countries/Territories	Record Count	% of 71	Bar Chart	<input type="button" value="Save Analysis Data to File"/> <input checked="" type="radio"/> Data rows displayed in table <input type="radio"/> All data rows (up to 200,000)	
<input type="checkbox"/>		PEOPLES R CHINA	15	21.127 %	<div></div>	<input type="button" value="Save Analysis Data to File"/> <input type="radio"/> Data rows displayed in table <input type="radio"/> All data rows (up to 200,000)	
<input type="checkbox"/>		USA	12	16.901 %	<div></div>		
<input type="checkbox"/>		SOUTH KOREA	9	12.676 %	<div></div>		
<input type="checkbox"/>		INDIA	8	11.268 %	<div></div>		
<input type="checkbox"/>		GERMANY	6	8.451 %	<div></div>		
<input type="checkbox"/>		ENGLAND	4	5.634 %	<div></div>		
<input type="checkbox"/>		JAPAN	4	5.634 %	<div></div>		
<input type="checkbox"/>		CANADA	3	4.225 %	<div></div>		
<input type="checkbox"/>		SWEDEN	2	2.817 %	<div></div>		
<input type="checkbox"/>		TAIWAN	2	2.817 %	<div></div>	<input type="button" value="Save Analysis Data to File"/> <input type="radio"/> Data rows displayed in table <input type="radio"/> All data rows (up to 200,000)	
<input checked="" type="button" value="View Records"/>	<input checked="" type="button" value="Exclude Records"/>	Field: Countries/Territories	Record Count	% of 71	Bar Chart		

(4 Countries/Territories value(s) outside display options.)

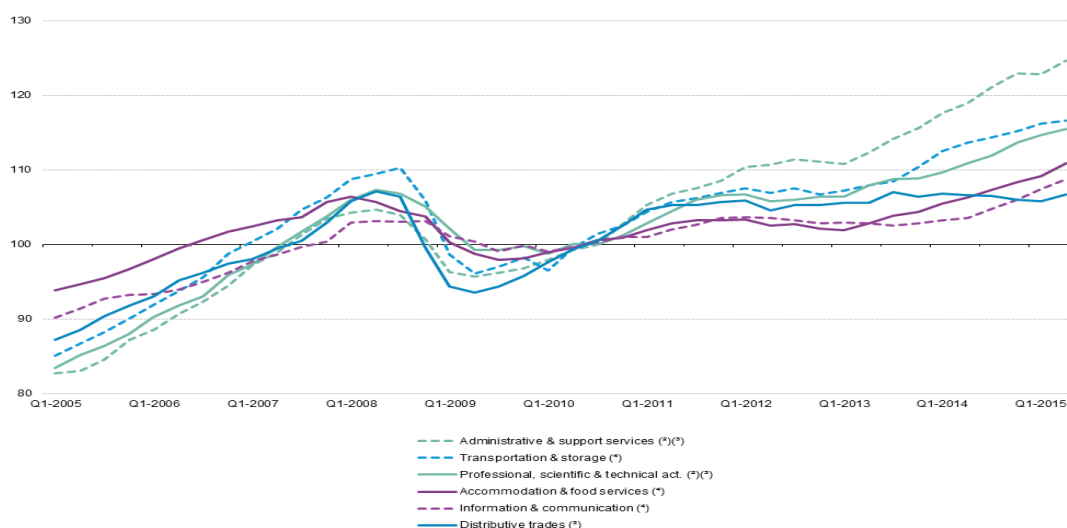
- The major contributor to the selected topic is China. That could be easily explained by population size in this country. Another message, which is being sent by the clip from Thomson Reuters webpage (same the Fig. 1) is that, the topic embracing clusters and energy efficiency issues is existent but still in very early stage of development. The discussion mainly spins around smart grids (e.g. Chen et al. 2015) and IT systems (e.g. Adel-Aissanou et al. 2016). We encountered one paper, which tackled energy efficiency and clustering phenomena in such energy intensive industry as chemical industry (Sun et al. 2013). Authors of this paper analyze “options for clusters of chemical process plants to decrease their energy and emission footprints”.
- This approach does not embrace variety of clustering actors, which is emphasized in our study. Here clustering phenomena is limited to concentration of similar technologically related productive facilities.



- Data about publishing on the provided topic suggest that the research interest in it is sharply increasing, hence the attention to interrelation between clustering phenomenon and energy consumption is raising. The published papers in SCOPUS database similarly like in Web of Science Core Collection database are mostly devoted to energy efficiency in IT: the search results indicated that during 2012- 2016 year there were 888 papers containing key-words “clusters” and “energy efficiency”; 566 out of them were attributed to computer science, 376 to engineering, 95 to mathematics, 54 to energy and 47 to physics and astronomy. Provided information, despite its sporadic nature, is sufficient to verify that there are no virtually papers devoted to relationship between clustering phenomena and energy efficiency. By clustering phenomena here we mean Porter’s approach to clusters provided above: clusters are groups of business companies, universities, NGO’s and other stakeholders, such as government and, we add, society. It means that effect of clustering of stakeholders of different nature, technology transfer, productivity increase and other, sometimes less tangible effects do not embrace energy security facet.

Assumptions and their grounding. We assume that one of main synergetic effects of clusters may be materialized in acceleration of smart growth. Smart growth due to its nature can not affect service sector, despite industrial sector and, in some specific way, agriculture also can be affected by smart growth, of course, we admit that without any objection. Anyway, it is unanimously agreed by development economists, that agricultural sector is less susceptible to innovations, industrial sector much more susceptible to innovations, and service sector development is an outcome, a result of industrialization and innovations. Expansion of service sector is directly affected not only by technological innovations innovations; it is affected by innovations of all range, including social ones.

Since clustering of wide range of innovations produce intangible results besides tangible, measurable results, we assume that clustering phenomena in some cases results social innovations, which affect energy consumption patterns and therefore impacts efficiency of energy consumption. Those social innovations, we believe, are embedded in behavioral patterns, which are being conditioned by clustering phenomena, at least partly; therefore they are intangible, difficult to measure, but still existant and therefore important for enhancement of energy security and, therefore, for overall sustainable development process.



(*) Seasonally and working-day adjusted.
 (*) As required by the STS Regulation.
 (*) 2005–09: estimates. Q2-2015: estimates.
 (*) 2005–09 and 2015: estimates.
 Source: Eurostat (online data codes: sts_trfu_q and sts_setu_q)

Analysis of patent applications from EU Member States and non-member countries

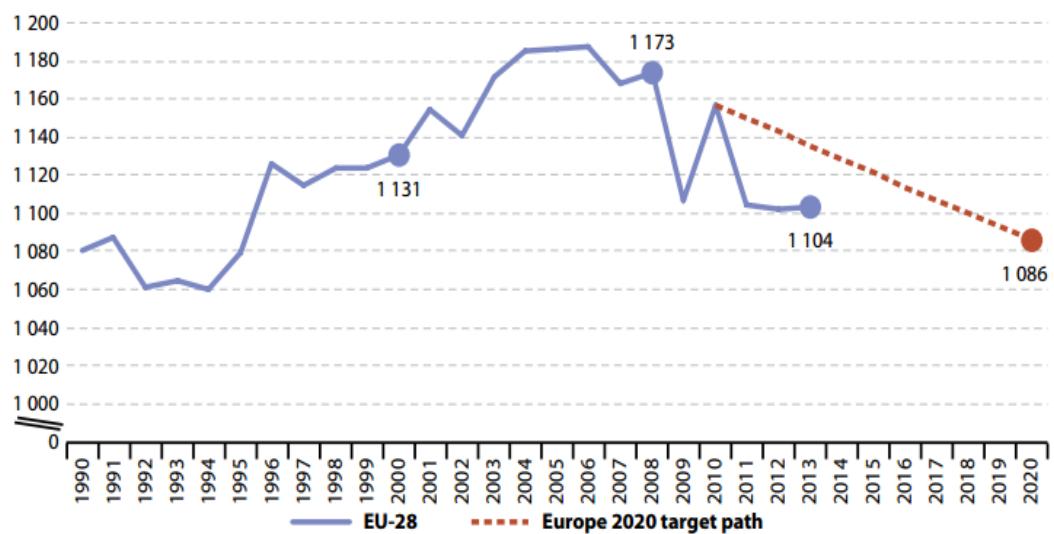
Among the EU Member States, Germany had by far the highest number of patent applications to the EPO in 2012, some 22.8 thousand (41.4 % of the EU-28 total), followed by France (8.3 thousand), the United Kingdom (5.1 thousand), Italy (4.2 thousand) and the Netherlands (2.8 thousand). From non-member countries, the highest numbers of patent applications were recorded from the United States (28.5 thousand) and Japan (22.7 thousand), followed by South Korea (5.9 thousand) and China (5.5 thousand).

Relative to its population, Sweden reported the highest number of patent applications, some 290 per million inhabitants, followed by Germany (278) and Finland (271). With the exception of Italy (70 patent applications per million inhabitants), all of the southern and eastern EU Member States as well as the [Baltic Member States](#) reported less than 50 patent applications per million inhabitants in 2012.

http://ec.europa.eu/eurostat/statistics-explained/index.php/Patent_statistics

- Patent applications for energy technologies
- An overview of the number of patent applications in 2012 from within the EU-28 to the EPO concerning energy technologies. The strong predominance of patents related to wind energy, photovoltaic energy and solar thermal energy is particularly notable, underlining the interest in harnessing energy from renewable sources. The number of patents related to energy storage is also relatively high, and this may in part also be linked to renewable sources: energy storage is a key issue in the balance between demand for electricity and the sometimes intermittent supply of electricity from wind and solar power.

Figure 2.18: Final energy consumption, EU-28, 1990–2013
(million tonnes of oil equivalent)



Source: Eurostat (online data code: [tsdpc320](#))

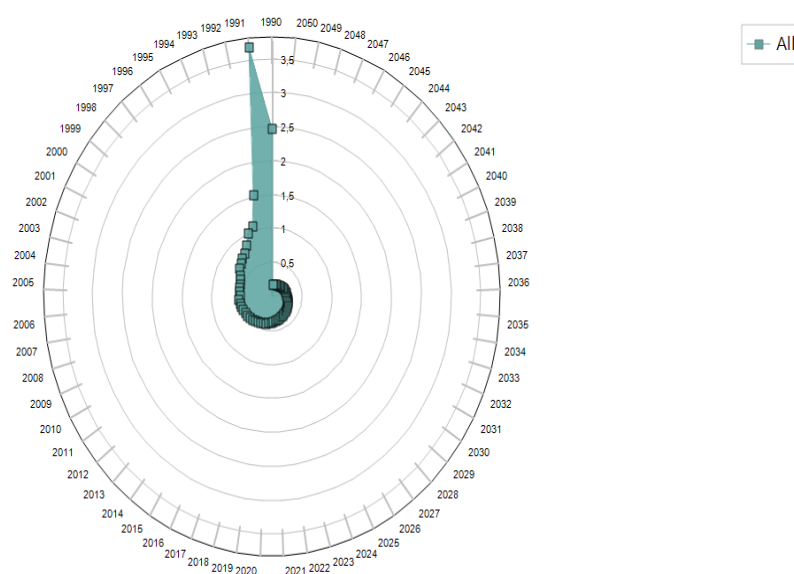
All: Final Energy Intensity (Kilowatt-Hour per European Euro)

Scenario: Baseline, Region: Germany



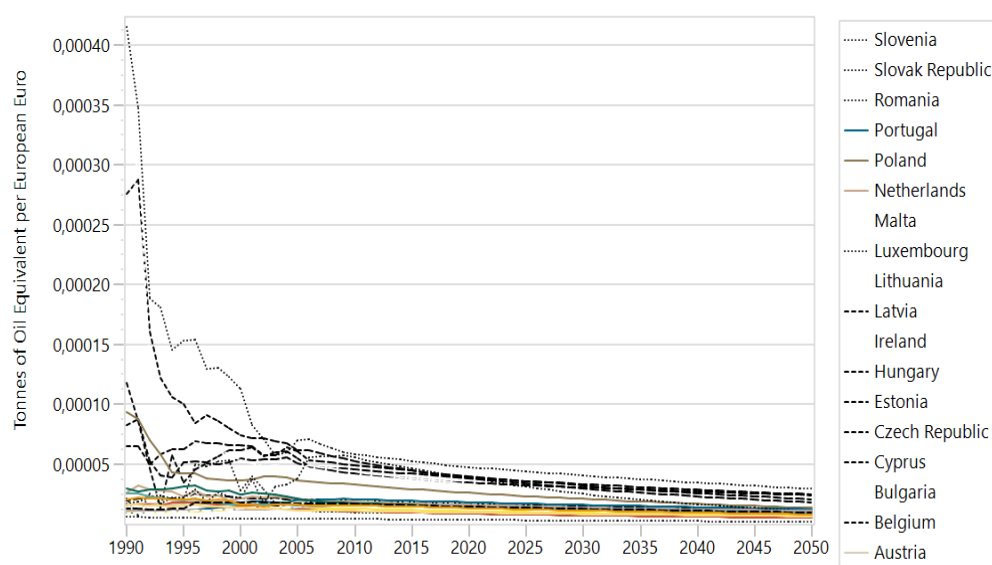
All: Final Energy Intensity (Kilowatt-Hour per European Euro)

Scenario: Baseline, Region: Lithuania



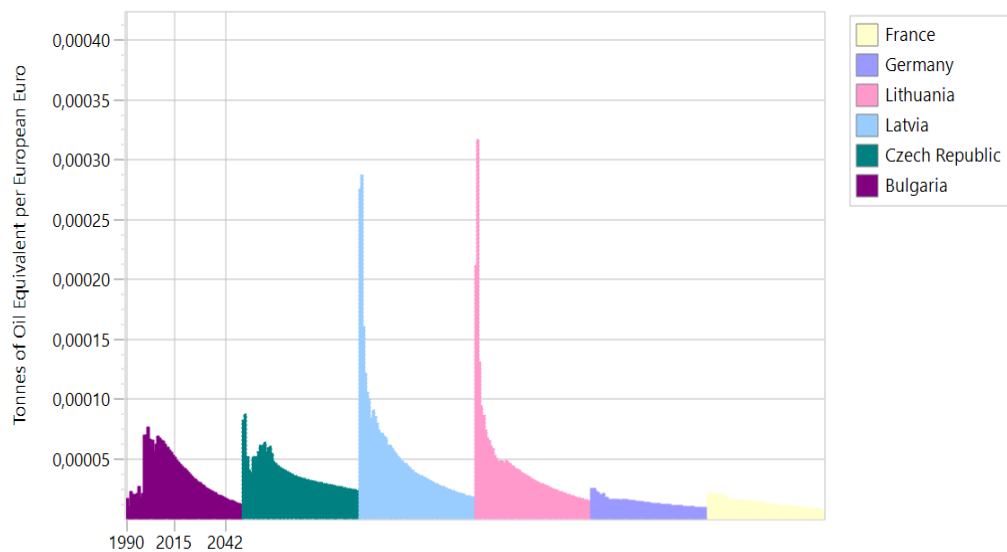
All: Final Energy Intensity (Tonnes of Oil Equivalent per European Euro)

Scenario: Baseline, Region: All Regions



All: Final Energy Intensity (Tonnes of Oil Equivalent per European Euro)

Scenario: Baseline, Region: All Regions



Concluding remarks

- CLUSTERS AFFECT SMART GROWTH, ESPECIALLY IN SERVICE SECTOR
- SERVICE SECTOR IF EXPANDING, HOUSEHOLD ENERGY CONSUMPTION IS GROWING
- ENERGY SECURITY IS DEPENDANT ON TANGIBLE (PATENTS, TECHNOLOGY) AND INTANGIBLE (e.g. CLUSTERS AFFECTING BEHAVIOURAL CHANGE)
- SMART GROWTH AND ENERGY SECURITY INDIRECTLY RELATED; CLUSTERING CAN REDUCE ENERGY INTENSITY IN SERVICE SECTOR

The Impact of Local Government Policy on Innovation Ecosystem: Case Study of Changzhou, China

Abstract

Purpose/ Research Question: Business nowadays is more and more relying on collaboration and network. Through open invention and coordination, companies attract the participation of a diversity of external contributors to create knowledge collectively (Chesbrough and Appleyard, 2007). This happens not only to leading western firms such as Intel, Google and Apple, but also to SMEs (small and medium enterprises) in emerging countries including China. Traditionally, China is known for its strong manufacturing capability. With the government promoting original design, creativity, product development and knowledge creation, firms are now seeking to upgrade towards high value-added activities. Large firms collaborate extensively with supply chain partners on new product development. Meanwhile SMEs also gather together, learning and sharing resources with research institutions, gradually forming a network based innovation ecosystem. The concept of innovation ecosystem is built upon business ecosystem, innovation and open strategy. In China, a typical innovation ecosystem consists of companies, universities and research institutions in a region or cluster, with service infrastructure supported by the local government (Ran and Liu, 2014). So far researchers have explored technology and production innovation from micro-level perspectives of firms, in particular in the high-tech industry such as mobile computing. However, the impact of policy on nurturing ecosystem, particularly in areas previously lack of innovation capability is unknown. Thus the main objective of this paper is to find out the linkage between local government policy and innovation starting from limited resource towards a matured ecosystem. The key research question is "what is the impact of government policy on the development of innovation ecosystem". With emphasis on interaction mechanism, an in-depth case study on Changzhou, China, a recently fast-growing region based on collaborative innovation, is conducted. It specifically aims to identify:

- Key activities of how innovation ecosystem is formed, developed and expanded.
- Role of local government policy in each stage of innovation ecosystem process.
- Interaction mechanism among industry, university and research in the ecosystem.

Key Literature Reviews: Current literature has covered the areas of innovation, business ecosystem and policy management. In terms of innovation, exploration refers to the searching and creating of new possibilities, technology breakthroughs, sometimes with risk (March, 1991); whereas

exploitation innovation means the expanding, enriching and strengthening of existing knowledge (March, 1991). Traditionally, innovation mostly takes place closely within companies based on ownership and control. The concept of open innovation emerges as firms collaborate with each other in developing new products and services (Chesbrough, 2003). Companies need to coordinate in a flexible way in the open approach (Chesbrough & Appleyard, 2007). By conducting in-depth case study on Nokia, Dittrich and Duysters (2007) find that innovation network effectively helps companies to adapt to the changing market conditions and strategy opportunities. Inter-firm collaboration, collective learning, open strategy bring in novel business models, as external resources, innovation communities, surrounding networks and ecosystems are all involved (Chesbrough & Appleyard, 2007). Business ecosystem is regarded as the combined feature of strategic alliance, open innovation, supply chain with diverse products and broader collaboration range. It is a dynamic process starting from existing collaboration network to expansion, convergence and renewal (Moore 1993). Iansiti and Levien (2004) suggest that resource sharing with external partners can result in innovation. Adner and Kapoor (2010) emphasize the co-innovation among supply chain partners, and propose the concept of innovation ecosystem. To further capture the dynamic feature of innovation ecosystem in China, there are studies on ecosystem growth mechanism (Lyu, Lan and Han, 2015), its coupling relations with technology population (Zhang, 2015), multi-level environmental factors (Xu and Li, 2014) and innovation efficiency (Liu and Chen, 2015). From the perspective of policy, it is found that network-based strategy of growth is suitable for companies in planned economies in transition such as China (Peng and Heath, 1996). To foster technology development infrastructure, government can use both mission-orientation and diffusion-orientation policy mechanism. In particular mission-orientation policy can develop technology leadership and create standards, whereas diffusion-orientation policy incrementally builds service capability by encouraging wider participants (Yu, Yue and Ping, 2012). However, current research on the influence of local government policies on building and enriching innovation ecosystem in emerging areas with inadequate knowledge resource is still limited. Thus this research will contribute to the theory of innovation ecosystem from this angle.

Design/ Methodology/ Approach: Most researchers choose qualitative method to explore key issues of innovation ecosystem (Zhao and Zeng, 2014). This is due to the fact that the theory of innovation ecosystem is still at early stage (Zen, Gou and Liu 2013), and limited findings on China cannot generate hypothesis for theory testing. The nature of this research requires for a theory-building approach with qualitative methodology, which can provide a deep understanding on significant issues which have not been explored (Yin, 2003). In particular, in-depth single case study is selected as the method to explore insightful details of innovation ecosystem and its interaction with local government policy. The case of Changzhou is specifically chosen. This region is located in Yangtze River Delta of China, original lacking universities and knowledge resources. During 2001 and 2005, privately owned enterprises in Changzhou started to approach the local government, seeking help on science and technology resources. From 2006 to 2010, with series of policies issued,

the "Changzhou model" was developed, combining science and education, and linking industry with university on public service platform provided by the government. With innovation ecosystem gradually matured, during 2011 to 2015, the Changzhou model was continuously enriched by internationalization, aggregation of global resources, and participation of financial capital intermediaries. The growth strategy of Changzhou region and its detailed process can potentially be implemented in other Chinese regions, which are seeking for network based innovation advancement. Our data collection includes document review and interview. Archival data was collected from Changzhou government statistics report and industry report, to capture series of local policies and events related to innovation from 2000 to 2015. Meanwhile, semi-structured face-to-face interviews were conducted to 3 officials of Changzhou Science and Technology Bureau, with questions on the background and prioritized concerns of issuing each policy, institutional and macro-environmental factors, interaction activities with the ecosystem, and strategic decisions of Changzhou innovation ecosystem. More specific questions were also asked regarding detailed policies on innovation from university, industry and research institution perspectives.

(Expected) Findings/Results: Based on this in-depth case study, our expected findings include a staged model of Changzhou innovation ecosystem with key events and policies; structure of the innovation ecosystem; and interaction mechanism among different players in the ecosystem. Changzhou innovation ecosystem experienced three main stages. Stage One (2001-2005) was the early formation stage. Since Changzhou had few universities and firms, policy was the key driver and initiator. The local government launched the "economy-science-education" project, attracting 5 colleges, SMEs and 100,000 experts with capital support and favorable terms. While universities can share research resources together, education programs were launched jointly by universities and companies for collective learning. A special admin office was formed to coordinate activities in Changzhou. In Stage Two (2006-2010), the innovation ecosystem was further improved. There was a clear business model integrating industry, university and research (Figure 1). By collaborating with China Academy of Sciences and other universities, 14 research centers and 20 R&D bases were launched, which further nurtured 700+ high-tech and start-up companies. With no boundaries among university, R&D centers and companies, hardware facilities and information were shared freely. 40 public service platforms were co-developed to create IP and solve technology-related problems together. At this stage, local government policies continuously facilitated the innovation ecosystem which in return provided feedback for policy improvement. Stage Three (2011-2015) was the extension of innovation ecosystem after reaching maturity and self-management. The Changzhou business model was implemented in other regions of China. Meanwhile, the local government assisted companies and R&D centers to collaborate with international partners by issuing new policies and reward system.